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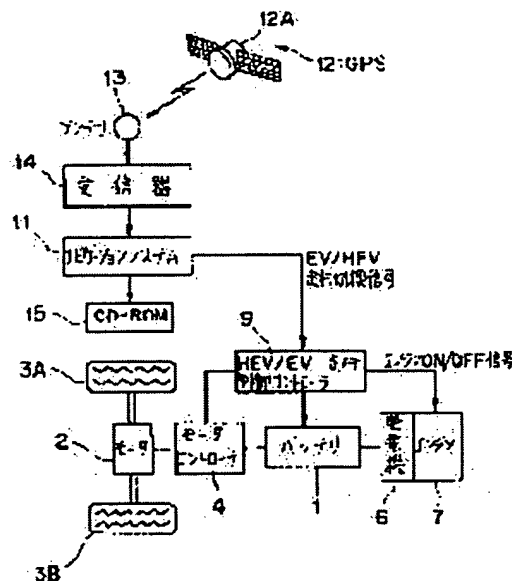
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(54) HYBRID ELECTRIC VEHICLE

(57)Abstract:

PURPOSE: To prolong travel distance in spite of using a battery of smaller capacity by stopping an internal combustion engine without fail in air pollution control tightened districts, and restricting the influence of the exhaust gas of the internal combustion engine to a minimum.

CONSTITUTION: The hybrid electric vehicle concerns one provided with an internal-combustion-engine 7 driven generator 6 connected to a battery 1 so as to be able to charge the battery 1, and a controlling means 9 for the internal combustion engine 7, and has a storing means 15 for storing the informations of air pollution control tightened districts, and a position measuring means 11 for measuring the present position of the vehicle. The operation of the internal combustion engine 7 is set to be stopped by an internal combustion engine controlling means 9, when the present position of the vehicle is in the air pollution control tightened districts.



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CLAIMS

[Claim(s)]

[Claim 1] A dc-battery and the motor for a drive which power is supplied from this dc-battery and drives a wheel, The motor control means which controls actuation of this motor while adjusting the power supplied to this motor according to output request actuation of a driver, In the hybrid electric vehicle which offered the generator connected to this dc-battery so that this dc-battery could be charged, the engines for generator which drive this generator, and the internal combustion engine control means which controls this internal combustion engine's actuation The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. The hybrid electric vehicle characterized by setting it up so that this internal combustion engine's actuation may be stopped if this internal combustion engine control means receives the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area from this decision means.

[Claim 2] A dc-battery and the motor for a drive which power is supplied from this dc-battery and drives a wheel, The motor control means which controls actuation of this motor while adjusting the power supplied to this motor according to output request actuation of a driver, The generator connected to this dc-battery so that this dc-battery could be charged, and the engines for generator which drive this generator, In the hybrid electric vehicle which offered the internal combustion engine control means which controls this internal combustion engine's actuation, and a remaining capacity detection means to detect the remaining capacity of this dc-battery The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. This internal combustion engine control means receives the detection information from this remaining capacity detection means. If the remaining capacity of this dc-battery falls to the setting minimum capacity value set up beforehand, this internal combustion engine will be operated. While being set up so that this internal combustion engine's actuation may be stopped if the remaining capacity of this dc-battery increases to the setting upper limit capacity value set up beforehand The hybrid electric vehicle characterized by being set up so that this internal combustion engine's actuation may be stopped if the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area is received from this decision means even if it is at this this internal combustion engine's actuation time.

[Claim 3] The hybrid electric vehicle according to claim 2 characterized by setting the setting minimum capacity value of the remaining capacity of this dc-battery as a value only with a necessary bigger capacity than the minimum capacity which may drive a car with this motor for a drive.

[Claim 4] In the hybrid electric vehicle which offered the control means which controls actuation of a dc-battery, the motor for a drive which power is supplied from this dc-battery and drives a wheel, the internal combustion engine for transit which drives a wheel, and a this motor and this internal combustion engine The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. The hybrid electric vehicle with which it will stop actuation of this internal combustion engine for a drive, and will be characterized by being set up so that it may drive only with this motor for a drive if this control means receives the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area from this decision means.

[Claim 5] The hybrid electric vehicle according to claim 1 to 4 which the navigation system for cars is carried in this automobile, and is characterized by using this navigation system for cars as this location measurement means.

[Claim 6] The hybrid electric vehicle according to claim 1 to 4 characterized by using the global positioning system as this location measurement means.

[Claim 7] The hybrid electric vehicle according to claim 5 or 6 characterized by using the map matching technique as this location measurement means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the hybrid electric vehicle which offered engines for generator or the internal combustion engine for transit especially about the electric vehicle which drives and runs a wheel with a motor.

[0002]

[Description of the Prior Art] Although the motion which is going to protect earth environment has become strong in recent years, especially contamination of the atmospheric air by consuming a fossil fuel excessively poses a serious problem, and prevention of air pollution is a technical problem very important when protecting earth environment. Also in an automobile, current has become in use [the engine by fossil fuels, such as a gasoline and gas oil], and since [this] especially a big city and the air pollution by the exhaust gas of an automobile [in / in inside / that city area] pose a very serious problem, the electric vehicle which does not take out an exhaust gas has been improved.

[0003] At present, various technical problems are left behind practically, and although this electric vehicle is put in practical use in some fields, by the time it generally spreads, it will not have resulted. Then, various techniques are proposed about current and an electric vehicle that an electric vehicle should be made a more practical thing. For example, since a limitation is in the engine performance of a dc-battery, if it is going to lengthen the mileage per 1 charge, it is necessary to carry a lot of dc-batteries, and car weight will increase sharply and the tooth space in a car will also be occupied greatly in the present electric vehicle. For this reason, there is fault that the power engine performance and amenity of a car will get worse. Of course, if the amount of a dc-battery is reduced, mileage per 1 charge cannot be lengthened.

[0004] Moreover, although it must charge in an electric vehicle if the remaining capacity of the dc-battery which is an energy source becomes less, the present condition is being unable to perform charge of this dc-battery easily like gassing. For this reason, when the car has stopped in the road with the lack of capacity of a dc-battery, the measures against this are not easy. In order to compensate the technical problem of an electric vehicle such at present, the so-called hybrid electric vehicle which carried the internal combustion engine in the electric vehicle itself is proposed.

[0005] There are the so-called series type hybrid car and a parallel type hybrid car in such a hybrid electric vehicle. If the internal combustion engine and the generator driven with this internal combustion engine are carried and the capacity of a dc-battery runs short, a series type hybrid car is running operating an internal combustion engine, generating electricity with a generator, and charging a dc-battery by this generated output, and even when the capacity of a dc-battery runs short, the transit of an electric vehicle of it will be attained.

[0006] Moreover, the parallel type hybrid car carries the internal combustion engine for transit in the motor for transit, and juxtaposition, and drives a wheel with the motor for transit, and also it can drive a wheel with the internal combustion engine for transit. Therefore, even when the capacity of a dc-battery runs short, transit of an automobile is attained with the internal combustion engine for transit. Therefore, the mileage of an automobile can be lengthened in such a hybrid electric vehicle, reducing exhaust gas and acquiring the depressor effect of atmospheric contamination by operating an internal combustion engine auxiliary.

[0007]

[Problem(s) to be Solved by the Invention] By the way, in an above-mentioned hybrid electric vehicle, if an internal combustion engine is operated, since exhaust gas comes out, naturally, air pollution cannot be prevented completely. Then, it is possible to run by operating an internal combustion engine and to run by stopping an internal combustion engine in the severe (that is, the degree of air pollution being comparatively high) city area of regulation of air pollution out of regulation of air pollution in the suburbs (that is, the degree of air pollution is comparatively low) where it is not severe.

[0008] Namely, for example, in the case of a series type hybrid car, operate engines for generator out of regulation of

air pollution in the suburbs where it is not severe, and a generator is turned. In this way, using the generated power, operate the motor for transit and it runs with the driving force by this motor for transit. In the severe city area of regulation of air pollution, engines for generator are stopped, and the motor for transit is operated using the power stored in the dc-battery, and it runs with the driving force by this motor for transit.

[0009] Moreover, for example, in the case of a parallel type hybrid car, in the suburbs with little air pollution, it runs with the driving force by the internal combustion engine for transit, and the internal combustion engine for transit is stopped, and the motor for transit is operated using the power of a dc-battery, and it runs with the driving force by this motor for transit in a city area with much air pollution. Mileage can be lengthened with small power resource, preventing the air pollution in the serious city area of thereby especially a situation.

[0010] Thus, with an area, in order to switch transit mode ** If it goes into air-pollution-control strengthening areas, such as a city area, a driver will carry out manually independently, and also For example, ** vehicle speed installs the means which will judge it as air-pollution-control strengthening areas, such as a city area, and will switch transit mode automatically if the transit frequency below constant value becomes high, and a means to send that they are air-pollution-control strengthening areas, such as a beacon, to ** city area. If this signal is received, the means which switches transit mode automatically can be considered.

[0011] However, even if it can judge judging independently whether the driver went into air-pollution-control strengthening areas, such as a city area, necessarily not having been performed certainly, and having gone into the metaphor air-pollution-control strengthening area, a driver does not necessarily switch transit mode promptly. Moreover, judging air-pollution-control strengthening areas, such as a city area, with the vehicle speed has a bad judgment system, and it is not practical.

[0012] Moreover, installing a beacon etc. in a city area requires big cost, and only the local information near the beacon is acquired, and if it does not wait to install a beacon etc. in all air-pollution-control strengthening areas by high density, it cannot use this means. It was originated in view of such a technical problem, and as this invention stops an internal combustion engine certainly, it aims at offering the hybrid electric vehicle which enabled it to lengthen mileage for the exhaust gas effect of an internal combustion engine with power resource small with a stop to the minimum in air-pollution-control strengthening areas, such as a city area.

[0013]

[Means for Solving the Problem] For this reason, the hybrid electric vehicle of this invention according to claim 1 A dc-battery and the motor for a drive which power is supplied from this dc-battery and drives a wheel, The motor control means which controls actuation of this motor while adjusting the power supplied to this motor according to output request actuation of a driver, In the hybrid electric vehicle which offered the generator connected to this dc-battery so that this dc-battery could be charged, the engines for generator which drive this generator, and the internal combustion engine control means which controls this internal combustion engine's actuation The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. If this internal combustion engine control means receives the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area from this decision means, it is characterized by being set up so that this internal combustion engine's actuation may be stopped.

[0014] Moreover, the hybrid electric vehicle of this invention according to claim 2 A dc-battery and the motor for a drive which power is supplied from this dc-battery and drives a wheel, The motor control means which controls actuation of this motor while adjusting the power supplied to this motor according to output request actuation of a driver, The generator connected to this dc-battery so that this dc-battery could be charged, and the engines for generator which drive this generator, In the hybrid electric vehicle which offered the internal combustion engine control means which controls this internal combustion engine's actuation, and a remaining capacity detection means to detect the remaining capacity of this dc-battery The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. This internal combustion engine control means receives the detection information from this remaining capacity detection means. If the remaining capacity of this dc-battery falls to the setting minimum capacity value set up beforehand, this internal combustion engine will be operated. While being set up so that this internal combustion engine's actuation may be stopped if the remaining capacity of this dc-battery increases to the setting upper limit capacity value set up beforehand If the decision information on a purport that the current position of this automobile is

in this air-pollution-control strengthening area is received from this decision means even if it is at this this internal combustion engine's actuation time, it is characterized by being set up so that this internal combustion engine's actuation may be stopped.

[0015] Moreover, the hybrid electric vehicle of this invention according to claim 3 is characterized by setting the setting minimum capacity value of the remaining capacity of this dc-battery as a value only with a necessary bigger capacity than the minimum capacity which may drive a car with this motor for a drive in the configuration according to claim 2. Moreover, the hybrid electric vehicle of this invention according to claim 4 In the hybrid electric vehicle which offered the control means which controls actuation of a dc-battery, the motor for a drive which power is supplied from this dc-battery and drives a wheel, the internal combustion engine for transit which drives a wheel, and a this motor and this internal combustion engine The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. If this control means receives the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area from this decision means, it stops actuation of this internal combustion engine for a drive, and is characterized by being set up so that it may drive only with this motor for a drive.

[0016] Moreover, the hybrid electric vehicle of this invention according to claim 5 is characterized by carrying the navigation system for cars in this automobile, and using this navigation system for cars as this location measurement means in the configuration according to claim 1 to 4. Moreover, the hybrid electric vehicle of this invention according to claim 6 is characterized by using the global positioning system as this location measurement means in the configuration according to claim 1 to 4.

[0017] Moreover, the hybrid electric vehicle of this invention according to claim 7 is characterized by using the map matching technique as this location measurement means in the configuration according to claim 5 or 6.

[0018]

[Function] In the hybrid electric vehicle of above-mentioned this invention according to claim 1, a location measurement means measures the current position of an automobile, and a decision means judges whether the current position of an automobile is in an air-pollution-control strengthening area based on the information from this location measurement means, and the air-pollution-control strengthening area information from a storage means.

[0019] In an internal combustion engine control means, if the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area is received from this decision means, an internal combustion engine's actuation will be stopped. Therefore, at this time, the motor for a drive operates using the power stored in the dc-battery, and drives a wheel without performing the generation of electrical energy with a generator. In the hybrid electric vehicle of above-mentioned this invention according to claim 2, a location measurement means measures the current position of an automobile, and a decision means judges whether the current position of an automobile is in an air-pollution-control strengthening area based on the information from this location measurement means, and the air-pollution-control strengthening area information from a storage means.

[0020] Moreover, on the other hand, a remaining capacity detection means detects the remaining capacity of a dc-battery. In an internal combustion engine control means, if it falls in response to the detection information from this remaining capacity detection means to the setting minimum capacity value to which the remaining capacity of this dc-battery was set beforehand, this internal combustion engine will be operated, and if it goes up to the setting upper limit capacity value to which the remaining capacity of this dc-battery was set beforehand, this internal combustion engine's actuation will be stopped. At the time of this internal combustion engine's actuation, power resource being recovered, while a generation of electrical energy is performed by the generator and this generated output charges a dc-battery, the motor for a drive operates using the power of a dc-battery, and a wheel is driven.

[0021] And if the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area is received from this decision means, an internal combustion engine's actuation will be stopped. Therefore, at this time, the motor for a drive operates using the power stored in the dc-battery, and drives a wheel without performing the generation of electrical energy with a generator. In the hybrid electric vehicle of above-mentioned this invention according to claim 3, the transit capacity of the car under a specific situation is secured. That is, when the remaining capacity of this dc-battery falls to setting minimum capacity value, he wants to operate this internal combustion engine and to generate electricity, but if the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area is received from this decision means at this time, an internal combustion engine's actuation must be stopped and the situation which cannot generate electricity can be considered. However, since the setting minimum capacity value of the remaining capacity of this dc-battery is set as the value only with a necessary bigger capacity than the minimum capacity which may drive a car with this

motor for a drive, the transit capacity of the car of only this necessary capacitive component is secured.

[0022] In the hybrid electric vehicle of above-mentioned this invention according to claim 4, transit is performed by control of a control means in the state of one drive of the drive condition only by the motor for a drive, the drive condition only by the internal combustion engine for transit, and the drive condition by the motor for a drive, and the internal combustion engine for transit. During transit, a location measurement means measures the current position of an automobile, and a decision means judges whether the current position of an automobile is in an air-pollution-control strengthening area based on the information from this location measurement means, and the air-pollution-control strengthening area information from a storage means.

[0023] In a control means, if the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area is received from this decision means, this internal combustion engine's actuation will be stopped and it will be made to drive only with this motor for a drive. In the hybrid electric vehicle of above-mentioned this invention according to claim 5, the navigation system for cars measures the location of an automobile, and this measurement information is sent to this decision means, and is used for control in above-mentioned drive mode.

[0024] In the hybrid electric vehicle of above-mentioned this invention according to claim 6, the location of a car is measured using a global positioning system. The map matching technique is used for measurement of the location of a car in the hybrid electric vehicle of above-mentioned this invention according to claim 7. That is, as a navigation system for cars, the map matching technique is used additionally or the map matching technique is additionally used for location measurement of the car by the global positioning system.

[0025]

[Example] Hereafter, the example of this invention is explained with reference to a drawing. The block diagram in which drawing 1 -3 show the hybrid electric vehicle as the 1st example, and drawing 1 shows typically the drive system and a generation-of-electrical-energy system, the flow chart with which drawing 2 shows the flow of the control action of the drive system and a generation-of-electrical-energy system, and drawing 3 are the explanatory views showing the change-over condition in the transit mode typically, and drawing 4 is the block diagram showing typically the drive system and generation-of-electrical-energy system of a hybrid electric vehicle as the 2nd example.

[0026] First, when the 1st example is explained, this hybrid electric vehicle is a series type hybrid car, as shown in drawing 1. In drawing 1, 1 is a dc-battery and this dc-battery 1 can also be repeatedly charged with the external battery charger (illustration abbreviation) with which a car is not equipped. 2 is a motor (motor for transit) to which power is supplied from a dc-battery 1, and the driving wheels 3A and 3B of an automobile drive it by this motor 2. Although the output of a motor 2 is controlled by the motor controller (motor control means) 4, it controls the output of a motor 2 by the motor controller 4 based on output request actuation (namely, treading-in condition of the accelerator pedal which is not illustrated) of a driver, the present operating state of a motor 2, etc. Moreover, by the motor controller 4, if a braking command is detected from treading in of the brake pedal which is not illustrated etc., a motor 2 is switched to a generator, and regenerative braking which gives damping force can be performed, generating electricity by the rotational energy from driving wheels 3A and 3B.

[0027] Moreover, 6 is a generator and this generator 6 is driven with engines for generator (henceforth an engine) 7. And it connects with the dc-battery 1 so that a dc-battery 1 can be charged with the power generated with this generator 6. An engine 7 has an output controlled by throttle opening adjustment etc. (illustration abbreviation). Control of this engine 7 has actuation controlled by the HEV/EV transit control means 9 with the function as an internal combustion engine control means.

[0028] In addition, although HEV is the abbreviated name of a hybrid electric vehicle (Hybrid Electric Vehicle), making a dc-battery 1 charge with the power which the engine 7 was operated and was generated with the generator 6, by operating a motor 2, it omits the run state (=HEV transit) which drives a car, and is also calling it HEV here. Moreover, although EV is the abbreviated name of an electric vehicle (Electric Vehicle), by stopping an engine 7, being stored in the dc-battery 1, and operating a motor 2 with power, it omits the run state (=EV transit) which drives a car, and is also calling it EV here.

[0029] That is, the HEV/EV transit control means 9 will operate an engine 7, if HEV transit is chosen, and if the condition of EV transit is chosen, it will stop an engine 7. Selection with HEV transit and EV transit is performed based on the information from the remaining capacity detection means (henceforth a remaining capacity meter) which was attached to information and a dc-battery 1 from the navigation system 11 and which is not illustrated.

[0030] That is, the HEV/EV transit control means 9 will operate an engine 7, if the signal of the purport in which HEV transit is possible is received from a navigation system 11 and the remaining capacity of a dc-battery 1 will fall to setting minimum capacity value based on the detection information from a remaining capacity meter, and if the remaining capacity of a dc-battery 1 increases to setting upper limit capacity value, it will control to stop actuation of

an engine 7. Moreover, if the signal of the purport which should carry out EV transit is received from a navigation system 11, it will control to always stop actuation of an engine 7.

[0031] In addition, setting minimum capacity value is the original minimum capacity Q2 here, although it is originally a minimum capacity which can obtain a predetermined output (it is enough for making a car drive) on a motor 2 with the current of a dc-battery 1. The large value Q ($=Q1+\alpha$) is suitably given as setting minimum capacity value. Since the generation of electrical energy which there is an area put into practice among EV transit like the after-mentioned, and is depended generator 6 in this area cannot be performed, only the capacitive component ($=\alpha$) considered to be enough to pass through such an area set up setting minimum capacity value too many, and, as for this, has secured the transit capacity of a car in this hybrid electric vehicle.

[0032] Moreover, in the HEV/EV transit control means 9, although he wants to carry out HEV transit originally, in case it runs the area upon which a duty of EV transit was imposed, in order to secure the distance of a car which can be run, based on relation with remaining capacity, the supply voltage to a motor 2 is controlled and an economy drive can be performed by controlling the motor controller 4. Here, if a navigation system 11 is explained, this navigation system 11 has offered the display (illustration abbreviation) which displayed the information processing part (illustration abbreviation) which measures the location (current position) of a car, and the location of the self-car on the map of the movement area of a car, and a map.

[0033] The function as a decision means to judge whether the location of a current car is an air-pollution-control strengthening area from the information from this location measurement means and the information about an air-pollution-control strengthening area is added to the information processing part besides the function as a location measurement means. As an air-pollution-control strengthening area, there are designated areas, such as the circumferences, such as a city area of the intense big city of air pollution, a hospital for which especially environmental protection is needed, and a school, etc. actually.

[0034] And in this navigation system 11, electronic navigation and the map matching technique are compounded and location measurement of a car is performed. As electronic navigation, it is what used GPS (Global Positioning System) 12 here. a signal necessary to two or more satellite (Navstar satellite) 12A and this satellite 12A in GPS12 -- delivery -- the terrestrial system (illustration abbreviation) which manages this is offered, and the electric wave transmitted from satellite 12A should be caught with an antenna 13, and pass the amplifier and receiver 14 which are not illustrated -- it is inputted into a navigation system 11.

[0035] In a navigation system 11, the location, i.e., the LONG, and LAT of a car are detectable based on the electric wave from satellite 12A inputted in this way. Moreover, it is what noted that, as for the map matching technique, a car usually ran a path on the street in principle, and the measurement error of the location of a car can be corrected by making the transit locus of a car match with a road configuration. Here, the transit locus of a car is obtained by following the location of the car obtained for the information from satellite 12A with time amount progress, and the error of the car location obtained with electronic navigation is corrected by making this transit locus match with a road configuration.

[0036] CD-ROM15 is connected to the navigation system 11 as a storage means which memorized the map of a desired district for the map display on the above-mentioned display, and this is used also for map matching. Moreover, the information about the air-pollution-control strengthening area (a zero emission zone and intense area of air pollution) of the inside in a map is also memorized by this CD-ROM15 with map information. With the decision means of a navigation system 11 It judges whether it corresponds to the air-pollution-control strengthening area where the location of the current car which obtained with electronic navigation and was corrected by map matching was given from CD-ROM15. In outputting the signal (EV signal) which imposes a duty of EV transit which stopped the engine 7 in corresponding to an air-pollution-control strengthening area and not corresponding to an air-pollution-control strengthening area, it outputs the signal (HEV signal) which permits the HEV transit which operated the engine 7.

[0037] Since the above configuration of the hybrid electric vehicle as the 1st example of this invention is carried out, control of the drive system of this hybrid electric vehicle and a generation-of-electrical-energy system is performed as shown in drawing 2 . That is, with the ON input of a key switch, this control is started and the location of a self-car is first measured by the navigation system 11 (step S1). That is, the location (LAT and LONG) of a self-car is measured by the electric wave from satellite 12for GPS A, and this is amended by map matching based on the map information from CD-ROM15.

[0038] Next, based on the positional information of a self-car and the information on the air-pollution-control strengthening area from CD-ROM15 which were measured, it is judged at step S2 whether the location of a current car is EV movement area (air-pollution-control strengthening area) (step S2), and if it is not EV movement area, it will be judged at step S3 whether it is under [current EV transit] *****. if it becomes during current EV transit, by step S4, power resource will be checked (namely, the information from a remaining capacity meter -- winning popularity), and

it will be judged at step S5 whether the remaining capacity of this dc-battery 1 is below predetermined capacity (setting minimum capacity value).

[0039] Moreover, if the remaining capacity of a dc-battery 1 is not below predetermined capacity (setting minimum capacity value), an engine 7 will continue EV transit, without making it start. And a return is carried out, if it is judged whether the key switch was turned OFF and a key switch is not turned OFF at step S6. If the remaining capacity of a dc-battery 1 becomes below predetermined capacity (setting minimum capacity value), it will progress to step S7 from step S5, will start an engine 7, and will switch to HEV transit. By this, a generator 6 is turned with an engine 7, a generation of electrical energy is started, from this generated output, a dc-battery 1 is charged and the remaining capacity of a dc-battery 1 is recovered.

[0040] thus, if switched to HEV transit, the following control period, it will progress to step S8 from step S3, power resource will be checked (namely, the information from a remaining capacity meter -- winning popularity), and it will be judged for the remaining capacity of a dc-battery 1 by step S9 whether it is more than predetermined capacity (setting upper limit capacity value). If the remaining capacity of a dc-battery 1 is not more than predetermined capacity (setting upper limit capacity value), an engine 7 will continue HEV transit, while it had made it operate.

[0041] And if the remaining capacity of a dc-battery 1 is recovered and it becomes more than predetermined capacity (setting upper limit capacity value), it will progress to step S10, an engine 7 will be suspended, and it will switch to EV transit. On the other hand, at step S2, if it is EV movement area, if it becomes during current and HEV transit, an engine 7 will be suspended and it will switch to EV transit by decision of step S11, (step S12).

[0042] Furthermore, if put into the key switch of a car at OFF, the main power supply of a control system will be turned OFF (step S12), and control will be finished. Thus, in this hybrid electric vehicle, in the air-pollution-control strengthening area 17 for which the intense air-pollution-control strengthening area 16 and the environmental protection of air pollution are needed while receiving the information from GSP12, as shown in drawing 3, EV transit is put into practice, air pollution is prevented, and by 18, mileage can be lengthened with small power resource except these areas (general area), controlling air pollution by considering as HEV transit, only when required. Of course, at the time of braking, it can generate electricity by regenerative braking using braking energy, and increase of mileage can be promoted in all areas. In addition, a sign 19 is this hybrid electric vehicle.

[0043] Thereby, preventing air pollution effectively, mileage can be lengthened with small power resource and the practicality of a hybrid electric vehicle can be raised sharply. Moreover, capacity Q2 of the original minimum as setting minimum capacity value Since the large value $Q (= Q1 + \alpha)$ is given suitably, even if it goes into EV movement area, the capacity of a dc-battery is secured and the transit capacity of a car is secured.

[0044] Moreover, in EV movement area, since the economy drive of a motor 2 can also be performed, the distance of the car included in EV movement area which can be run is secured at this point. Next, when the 2nd example is explained, this hybrid electric vehicle is a parallel type hybrid car, as shown in drawing 4. In drawing 4, since the 1st example (drawing 1) and a same sign show a part similarly, explanation is omitted here and only a different part is explained. 8 is an internal combustion engine for transit (henceforth an engine), and this engine 8 differs from a motor 2 in driving wheels 3A and 3B in juxtaposition -- it is installed so that driving wheel 3C of a lot and 3D may already be driven.

[0045] And 10 is a HEV/EV transit control means (control means), based on the run state of a car, operates either of a motor 2 and an engine 8, or operates both by suitable torque allocation. However, about the area upon which a duty of EV transit was imposed, it is made to surely stop and an engine 8 controls to make it drive only by the motor 2.

[0046] Also in a parallel type hybrid car, preventing air pollution effectively, almost like the case of the series type hybrid car of the 1st example, mileage can be lengthened with small power resource and the practicality of a hybrid electric vehicle can be sharply raised by such configuration. In addition, it may replace with satellite navigation, or may use together with satellite navigation for location measurement of a car, and self-contained navigation may be used for it. Although this self-contained navigation guesses the location of a self-car by measuring the migration length of a car, and change of the migration direction, and compounding these, it can use a wheel speed rotational frequency for calculation of the migration length of a car, and can use the yaw angular velocity of a car for calculation of change of the migration direction of a car. The information from a wheel speed sensor, various kinds of gyroscopes, an earth magnetism sensor, etc. is inputted into a navigation system 11 at this, and it uses for the guess of the location of a self-car.

[0047]

[Effect of the Invention] As explained in full detail above, according to the hybrid electric vehicle of this invention according to claim 1 A dc-battery and the motor for a drive which power is supplied from this dc-battery and drives a wheel, The motor control means which controls actuation of this motor while adjusting the power supplied to this motor according to output request actuation of a driver, In the hybrid electric vehicle which offered the generator

connected to this dc-battery so that this dc-battery could be charged, the engines for generator which drive this generator, and the internal combustion engine control means which controls this internal combustion engine's actuation. The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. By the configuration that it will be set up so that this internal combustion engine's actuation may be stopped if this internal combustion engine control means receives the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area from this decision means. In an air-pollution-control strengthening area, the transit which does not operate an internal combustion engine is put into practice, and air pollution is prevented certainly. Thereby, controlling air pollution, mileage can be lengthened with small power resource and the practicality of the so-called series-type hybrid electric vehicle can be raised sharply.

[0048] According to the hybrid electric vehicle of this invention according to claim 2, moreover, a dc-battery, The motor for a drive which power is supplied from this dc-battery and drives a wheel, and the motor control means which controls actuation of this motor while adjusting the power supplied to this motor according to output request actuation of a driver, The generator connected to this dc-battery so that this dc-battery could be charged, and the engines for generator which drive this generator, In the hybrid electric vehicle which offered the internal combustion engine control means which controls this internal combustion engine's actuation, and a remaining capacity detection means to detect the remaining capacity of this dc-battery. The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. This internal combustion engine control means receives the detection information from this remaining capacity detection means. While being set up so that this internal combustion engine's actuation may be stopped if this internal combustion engine will be operated if the remaining capacity of this dc-battery falls to setting minimum capacity value, and the remaining capacity of this dc-battery increases to setting upper limit capacity value. By the configuration that it will be set up so that this internal combustion engine's actuation may be stopped if the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area is received from this decision means even if it is at this this internal combustion engine's actuation time. In an air-pollution-control strengthening area, the transit which does not operate an internal combustion engine is put into practice, and air pollution is prevented certainly. Moreover, except these areas, mileage can be lengthened with small power resource, the generation of electrical energy by the internal combustion engine being performed appropriately, and controlling air pollution, only when required. The practicality of size, thus the so-called series-type hybrid electric vehicle can be raised sharply.

[0049] moreover, according to the hybrid electric vehicle of this invention according to claim 3, rather than the minimum capacity in which the setting minimum capacity value of the remaining capacity of this dc-battery may drive a car with this motor for a drive, by the configuration of being set as a big value, though air pollution prevents certainly, only a necessary capacity can secure the transit capacity of a car and can boil further the practicality of the so-called series-type hybrid electric vehicle, and it can be made to improve in a configuration according to claim 2.

[0050] According to the hybrid electric vehicle of this invention according to claim 4, moreover, a dc-battery, In the hybrid electric vehicle which offered the control means which controls actuation of the motor for a drive which power is supplied from this dc-battery and drives a wheel, the internal combustion engine for transit which drives a wheel, and a this motor and this internal combustion engine. The storage means which memorized the information on an air-pollution-control strengthening area, and a location measurement means to measure the current position of this automobile, Based on the information from this location measurement means and this storage means, a decision means to judge whether the current position of this automobile is in this air-pollution-control strengthening area is established. If this control means receives the decision information on a purport that the current position of this automobile is in this air-pollution-control strengthening area from this decision means. Actuation of this internal combustion engine for a drive is stopped, the transit which does not operate an internal combustion engine in an air-pollution-control strengthening area by the configuration of being set up so that it may drive only with this motor for a drive is put into practice, and air pollution is prevented certainly. Controlling air pollution, mileage can be lengthened with small power resource and the practicality of the so-called parallel-type hybrid electric vehicle can be raised sharply.

[0051] Moreover, in a configuration according to claim 1 to 4, the navigation system for cars is carried in this automobile, and a location measurement means can be constituted from low cost, and it becomes easy to acquire each above-mentioned effectiveness by the configuration that this navigation system for cars is used as this location

measurement means according to the hybrid electric vehicle of this invention according to claim 5.

[0052] Moreover, in a configuration according to claim 1 to 4, as this location measurement means, an accurate location measurement means can be constituted and it becomes easy to acquire each above-mentioned effectiveness by the configuration that a global positioning system is used according to the hybrid electric vehicle of this invention according to claim 6. Moreover, in a configuration according to claim 5 or 6, as this location measurement means, the precision of a location measurement means can be raised and it comparatively becomes easy to acquire each above-mentioned effectiveness by low cost by the configuration that the map matching technique is used according to the hybrid electric vehicle of this invention according to claim 7.

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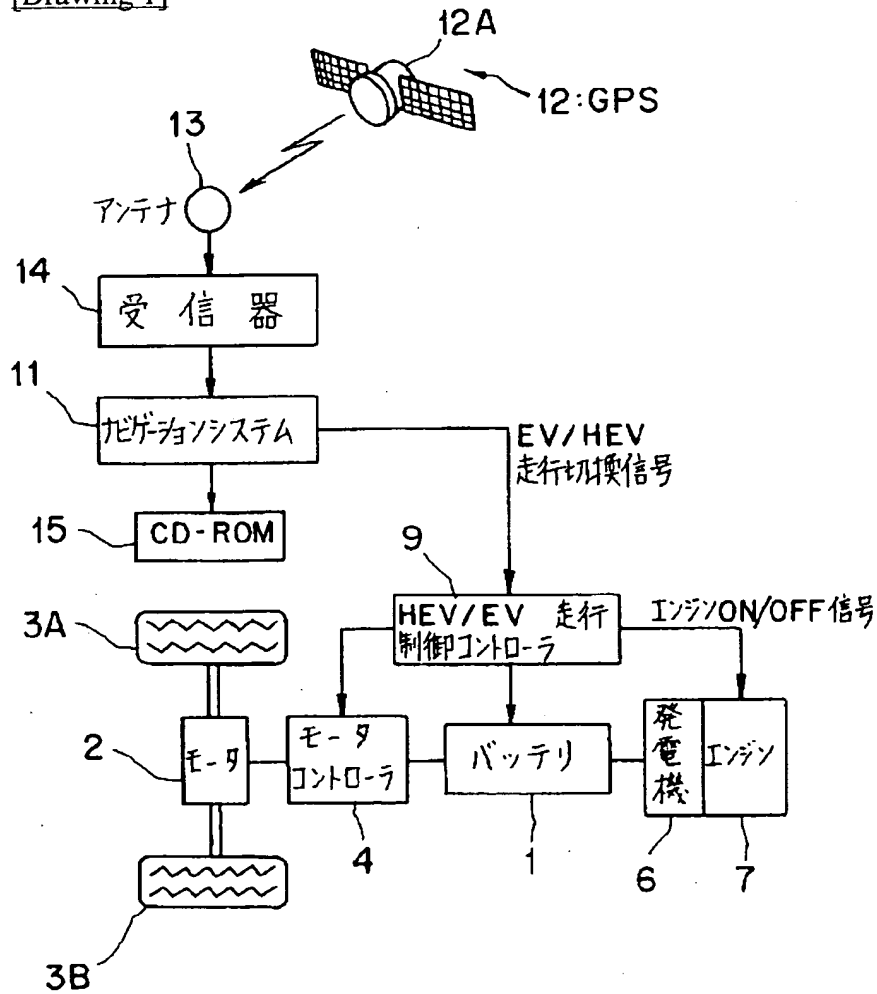
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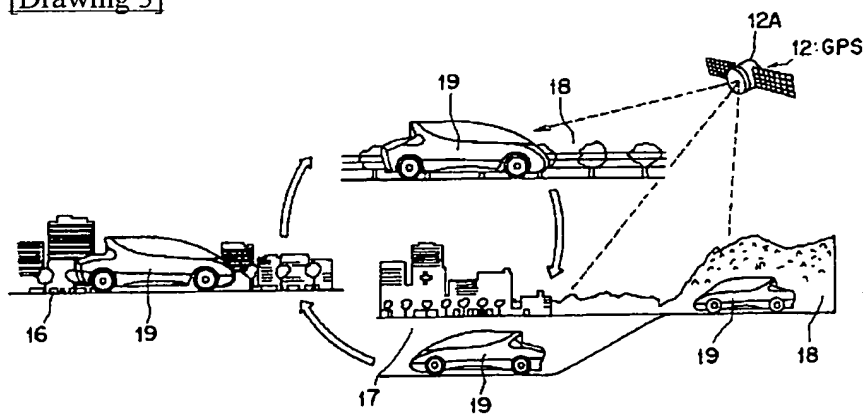
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DRAWINGS

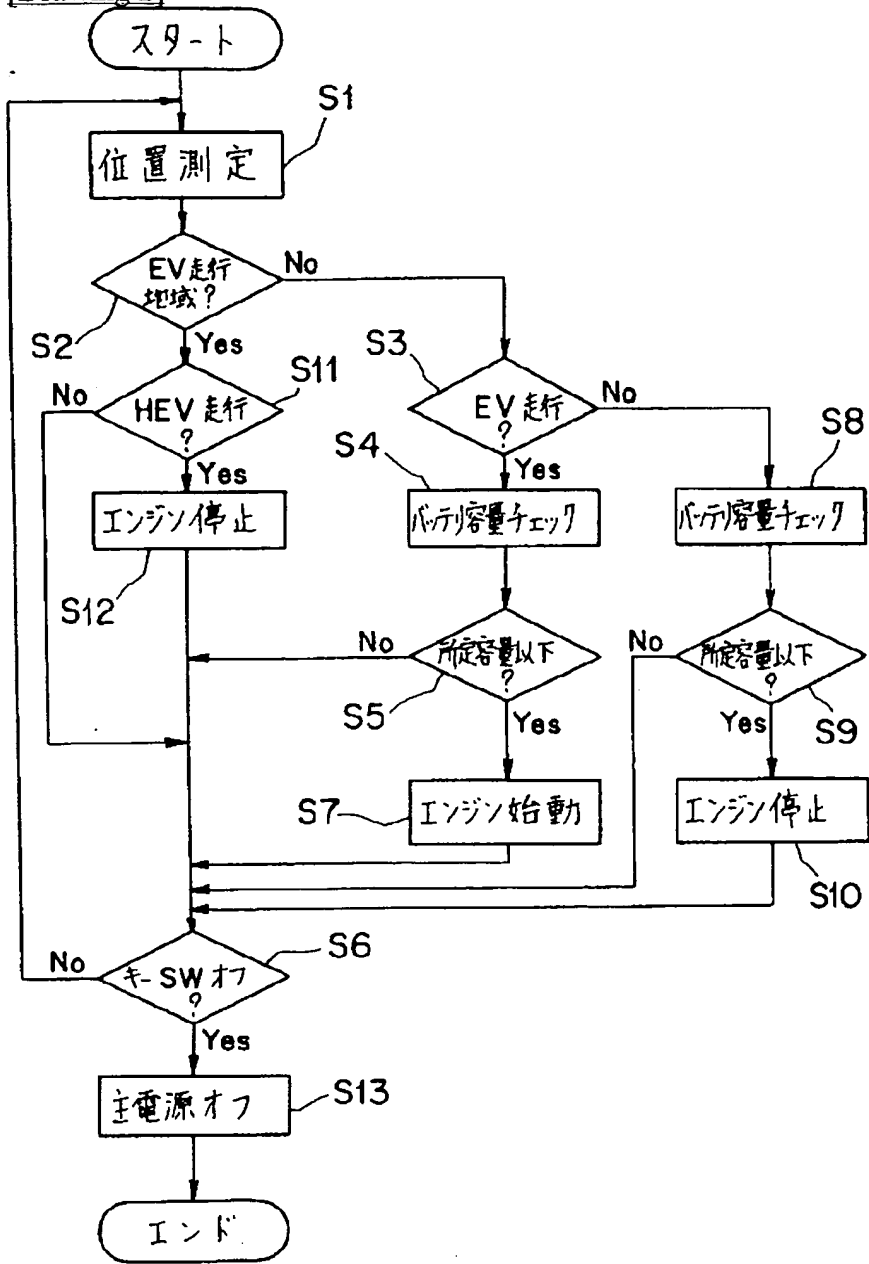
[Drawing 1]



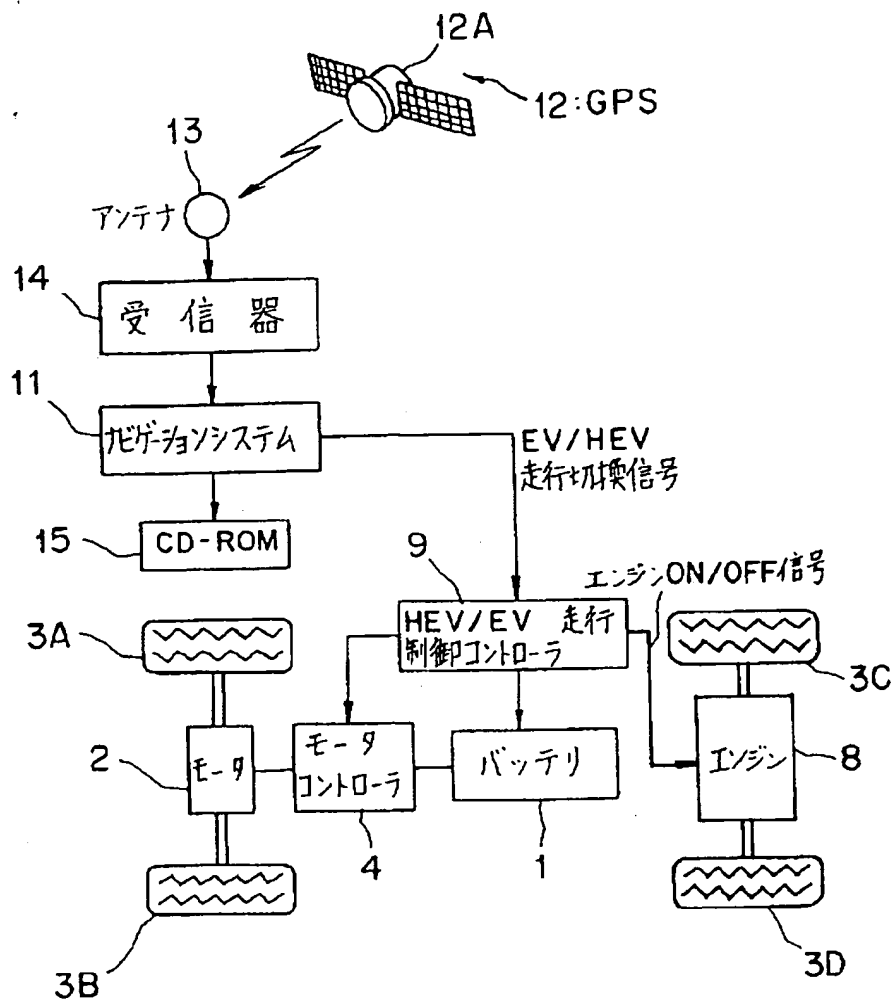
[Drawing 3]



[Drawing 2]



[Drawing 4]



[Translation done.]